EGU24-2386, updated on 15 Feb 2025
https://doi.org/10.5194/egusphere-egu24-2386
EGU General Assembly 2024

Impact of a severe dust intrusion on surface water temperature in subtropical Lake Kinneret

Pavel Kishcha[1], Yury Lechinsky[2], and Boris Starobinets[1]
[1]Tel Aviv University, Department of Geophysics, Tel Aviv, Israel (pavelk@tauex.tau.ac.il)
[2]Kinneret Limnological Laboratory, Israel Oceanographic and Limnological Research, Migdal, Israel

Climate model predictions have shown that Lake Kinneret could disappear by the end of the 21st century due to decreasing precipitation and increasing evaporation. Kinneret surface water temperature (SWT) is one of the main factors determining evaporation. During the last several decades, observations and model data showed increasing desert dust pollution over the Eastern Mediterranean. Generally, dust impact on lake SWT has not yet been discussed in previous publications.

We investigated the impact of an extreme dust intrusion on the diurnal behaviour of SWT in Lake Kinneret, which appeared from September 7 – 9, 2015, when dust aerosol optical depth (AOD) ranged from 0.2 to 1.5. This was carried out using METEOSAT and in-situ observations of SWT. In the presence of dust, METEOSAT showed that SWT decreased along with increasing dust pollution, both in the daytime and nighttime. This contradicted in-situ measurements of SWT at a depth of 20 cm which showed an increase up to 1.2 °C in the daytime and up to 1 °C in the nighttime: this was in comparison to daytime and nighttime SWT on clear-sky Sept. 6. This in-situ SWT was in line with in-situ radiometer measurements of upwelling longwave radiation (ULWR) which is determined by actual SWT. This led us to the conclusion that, in the presence of dust, in-situ SWT measurements were capable of reproducing Kinneret SWT.

In the daytime, an observed increase in air temperature (Tair) on dusty days Sept. 7 and 9 contributed to an increase in daytime Kinneret SWT. However, a decrease in daytime Tair on Sept. 8 (in the presence of maximal dust pollution) contributed to a decrease in daytime Kinneret SWT.

As for the nighttime on dusty days Sept. 7–9, in-situ measurements showed that an increase in Tair up to 4.3 °C was accompanied by an increase in SWT up to 1 °C, compared to nighttime Tair and SWT on clear-sky Sept. 6. This was in line with ULWR measurements, which showed that nighttime ULWR on each dusty day under study was higher than nighttime ULWR on clear-sky Sept. 6. This is evidence that dust pollution reflects part of ULWR back to the surface of the lake, leading to a noticeable increase in nighttime SWT.

During the dust intrusion, a noticeable increase in absolute atmospheric humidity (ρ_v) over the lake was observed: ρ_v reached 30%, 20%, and 15% in the presence of maximum, intermediate, and low dust pollution on Sept. 8, 9, and 7 respectively: this was in comparison to ρ_v on clear-sky Sept.

6. The maximal increase in ρ_v on Sept. 8 was observed in the absence of moisture advection: this indicates that dust intrusion can cause additional evaporation from Lake Kinneret. This finding implies the following significant point: increasing desert dust pollution over the Eastern Mediterranean can intensify the drying up of Lake Kinneret.

Reference: Kishcha et al., *Remote Sensing* **2023**, https://doi.org/10.3390/rs15225297